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Application Number

09/981,620

Filing Date

October 16, 2001

First Named Inventor

Richard L. Coulson

Art Unit

2189

Examiner Name

Kevin Verbrugge

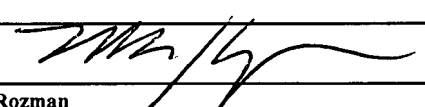
Attorney Docket Number

ITL.1592US (P11456)

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Richard L. Coulson

§ Group Art Unit: 2189

Serial No.: 09/981,620

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Filed: October 16, 2001

Examiner: Kevin Verbrugge

For: Mass Storage Caching Processes For
Power Reduction

Atty. Dkt. No.: ITL.1592US (P11456)

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REPLY BRIEF

Sir:

Appellants respectfully file this Reply Brief in response to the Examiner's Answer mailed on March 21, 2007.

I. REPLY

As to independent claims 107, 126 and 137, each of these claims recite that a controller is to queue one or more operations for a rotating storage device. Clearly, from this claim language a queue must exist for storage of these operations. Cohn teaches and the Examiner asserts that data sectors are written to a cache memory 106 and are designated with a particular state, i.e., new. However, in this regard Cohn simply teaches that when there is space in a cache, data sectors are written into the cache and parameters are updated. Cohn, FIG. 5; p. 13, line 31 – p. 14, line 2. Nothing in this or any other portion of Cohn however teaches a queue for storage of memory operations or performing a queue of operations.

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Stephanie Petreas

To the extent that the Examiner's Answer contends that "queue" is not well defined, Applicant respectfully disagrees. In this regard, the Specification makes clear reference to a queue of memory operations which may include new cache writes as well as data prefetches. Further described is the removal of redundant entries from such a queue. Specification as filed, p. 7, line 20 – p. 8, line 3. Thus clear support for a queue being something more than mere storage in a cache memory is set forth in the application.

In sum, the following passages are all that the Examiner points to in contending that Cohn teaches queuing of operations for a rotating storage device while it is spun down:

Power consumption is reduced because disk accesses which are caused by the need to maintain consistency between the data stored in the cache and on the storage element are restricted to occasions when an access to the storage element would be required anyway because a read or write request could not be satisfied from the cache. Since the number of times the storage element has to be accelerated to operating speed is reduced, the power consumption is also reduced. Cohn, p. 2, lns. 13-19.

The cache is used as a repository enabling small separate Read/Write operations to be performed without activating the disk. Cohn, p. 2, lns. 25-26.

Each time a read or write request has given rise to an access to the disk storage device, a destage takes place for a certain period of time if there are New sectors in the cache. Cohn, p. 11, lns. 17-19.

A New sector is replaced only as a result of a Write operation which provides a fresher version of that sector. It then remains New. A New or Consistent sector becomes Invalid if a Write operation is performed directly to the data storage device 104 bypassing the cache. Cohn, p. 11, ln. 35 – p. 12, ln. 4.

If necessary, a destage is performed at this opportunity. If the write is not large then the sector is written to the cache. Cohn, p. 12, ln.35 – p. 13, ln. 2.

When writing data only two subcases may arise. When writing a small amount of data, each sector which exists in the cache is replaced by the newer version, and is

marked New. Sectors not already in the cache are written into the cache, by replacing other existing consistent sectors, if there is a sufficient number of these. Cohn, p. 13, ln. 31 – p. 14, ln. 2.

Look carefully at these portions, while they teach storage of data to the cache memory, nothing here or anywhere else in Cohn teaches queuing of memory operations.

Furthermore, the Examiner nowhere sets forth in the Answer any basis that the controller performs one or more queued operations for the rotating storage device in response to a miss as recited by these claims. That is, while Cohn performs a destaging when its disk drive is rotating, such operation is not done in response to a miss. As such, the independent claims are patentable.

With regard to the rejection of dependent claims 111-114, 130-133 and 141-144, the Office Action simply relies on Official Notice to contend that prefetching was well known. While prefetching may be known, nothing in the Final Office Action or the Examiner's Answer in anyway indicates why one of ordinary skill in the art would have a reason to include prefetching operations in a queue of memory operations. This is especially so, as the only cited reference, Cohn, simply teaches that data is stored in a cache memory when an associated disk drive is not powered up. Furthermore, a mere indication of the existence of prefetching nowhere teaches determining in a controller if a prefetch is desirable in response to a read request as recited in dependent claims 112, 131 and 142. Nor does this Official Notice anywhere address a controller that determines if a read request is a sequential stream and for performing a prefetch if so as set forth in claims 113, 132 and 143.

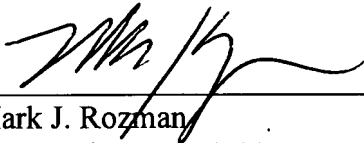
With regard to dependent claims 114, 133 and 144, the indication of Official Notice with respect to prefetching operations addresses nothing as to the recited operation of a controller to determine if one or more queued operations are desirable.

II. CONCLUSION

For the reasons set forth herein, as well as set forth in the Appeal Brief, Appellants respectfully request that each of the final rejections be reversed and that the claims subject to this Appeal be allowed to issue.

Respectfully submitted,

Date: 5/18/07



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